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**(54) INK, AND METHOD AND APPARATUS FOR INK JET RECORDING USING THE SAME**

**(57)Abstract:**

PURPOSE: To obtain an ink which can be applied to any desired recording material, gives a weather-resistant record with a good print quality, and is suitable for ink jet recording by using a water-sol. resin and a water-sol. monomer as the essential components.

CONSTITUTION: An ink is prep'd. by dispersing or dissolving a pigment, a water-sol. resin pref. having a wt.-average mol.wt. of 3.000=30,000, a water-sol. monomer which solidifies when it receives energy (e.g. an ultraviolet-polymerizable monomer, pref. an acrylic or epoxy monomer), and a photopolymer. initiator in an aq. medium. A dye may be jointly used with the pigment, pref. in a wt. ratio of (8:2)-(2:8). The ink is applied to a recording medium by ink jet method and cured by exposing to ultraviolet rays, heat, or an electron beam.

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**CLAIMS****[Claim(s)]**

- [Claim 1] an aquosity solvent — the ink characterized by including a pigment, water soluble resin, the water-soluble monomer solidified by grant of energy, and a photopolymerization initiator at least inside of the body.
- [Claim 2] Ink according to claim 1 which has the weight average molecular weight of said water soluble resin in the range of 3000 thru/or 30000.
- [Claim 3] Ink according to claim 1 which has said pigment in a distributed condition.
- [Claim 4] Furthermore, ink containing a color according to claim 1.
- [Claim 5] Ink according to claim 4 which has said pigment and said color in the range of 8:2-2:8 by the weight ratio.
- [Claim 6] Ink according to claim 1 which contains the monomer which has a polyfunctional radical as said water-soluble monomer.
- [Claim 7] Ink according to claim 1 which contains said water-soluble monomer in 1% – 10% of range of all ink weight.
- [Claim 8] Ink according to claim 1 said whose energy is ultraviolet rays, heat, or an electron ray.
- [Claim 9] Ink according to claim 1 which adjusted viscosity to 10cps or less.
- [Claim 10] Ink according to claim 1 which adjusted pH to the range of 7-10.
- [Claim 11] Ink containing 50% or more of water of all ink weight according to claim 1.
- [Claim 12] The ink jet record approach characterized by applying the ink of a publication to said claim 1 thru/or any 1 of 11 as said ink in the ink jet record approach which records by making the ink droplet formed with the ink jet method adhere to a recorded material.
- [Claim 13] The ink jet record approach according to claim 12 that said ink jet method is a method which makes heat energy act on ink.
- [Claim 14] The ink jet record approach according to claim 12 that said recorded material is a thing without ink absorptivity.
- [Claim 15] Furthermore, the ink jet record approach according to claim 12 of having the process which gives ultraviolet rays, heat, or an electron ray to the ink adhering to a recorded material.
- [Claim 16] The ink cartridge characterized by applying the ink of a publication to said claim 1 thru/or any 1 of 11 as said ink in the ink cartridge which has the ink hold section which held ink.
- [Claim 17] The record unit characterized by applying the ink of a publication to said claim 1 thru/or any 1 of 11 as said ink in the record unit which has both the head sections to carry out the regurgitation, using as an ink droplet the ink hold section which held ink, and said ink.
- [Claim 18] The record unit according to claim 17 which heat energy is made to act on said ink, and performs the ink regurgitation in said head section.
- [Claim 19] The ink jet recording apparatus characterized by having an ink cartridge or a record unit given in any [ said claim 16 thru/or ] of 18 they are in the ink jet recording apparatus which records by making the ink droplet formed with the ink jet method adhere to a recorded material.
- [Claim 20] The ink jet recording device according to claim 19 further equipped with a means to irradiate ultraviolet rays, heat, or an electron ray, to said recorded material.

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**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the ink jet record approach using this ink, and the equipment for ink jets which applied this ink further about ink and the ink which suits record to the medium which does not especially have ink absorptivity.

[0002]

[Description of the Prior Art] There is solid ink which dissolves a color in the drainage system ink which dissolved the color in the drainage system solvent as a color material, and the wax system solvent solidified in ordinary temperature as ink of the ink jet recording device printed by injecting liquid ink from a head nozzle, and is injected and printed from a head where heating fusion is carried out.

[0003] Moreover, about the ink for an ink jet print of an ultraviolet curing mold, there are some which used water soluble dye as indicated by JP,5-186725,A, and printing to a regular paper and recycled paper is made easy.

[0004] Moreover, to the plastic plate, as the image formation approach, the sublimability color is used for ultraviolet curing mold resin as indicated by JP,52-142516,A.

[0005]

[Problem(s) to be Solved by the Invention] There is a problem shown below in a Prior art.

[0006] When using 1 and drainage system ink for color printing (for example, when it printed by the first amorous glance, and the second amorous glance is printed after the first amorous glance dried) and the dot of the second amorous glance lapped with the first amorous glance, there was a problem on which the color of the first amorous glance remelts and bleeds and printing grace gets worse.

[0007] Since they use the solvent permeability to paper, if plastics is used as recorded materials, while 2 and drainage system ink will require time amount by ink desiccation, they cannot form an image with abrasion resistance. Therefore, as a recorded material, paper will be applicable.

[0008] Although a color does not bleed even if moisture adheres to 3 and ultraviolet curing mold resin again after printing in the ink which mixed water soluble dye, the color by UV irradiation fading is not avoided.

[0009] Although a recorded material is not chosen in 4 and solid ink, since it is the soft quality of the material of a wax, a printing dot will peel easily also in weak frictional force. Moreover, since the ink which generally contains an organic solvent makes a solvent smell emit, there is [ a problem ] to an environment.

[0010] It is necessary to heat a recorded material at 120-180 degrees C about the ink which used the sublimability color for 5 and ultraviolet-rays hardening resin, and a recorded material is restricted.

[0011]

[Means for Solving the Problem] Then, the purpose of this invention does not choose a recorded material, but is to offer the ink jet record approach and recording device using the ink which enables good record of printing grace with weatherability, and this.

[0012] The above-mentioned purpose is attained by the following this inventions.

[0013] That is, it is the ink jet record approach characterized by for this invention being a pigment, water soluble resin, the water-soluble monomer solidified by grant of energy, and ink characterized by including a photopolymerization initiator at least, and this invention applying the ink of said this invention as said ink into an aquosity liquid solvent in the ink jet record approach which records the ink droplet formed with the ink jet method by making it adhere to a recorded material.

[0014] Furthermore, this invention is an ink cartridge characterized by to apply the ink of said this invention as said ink in the ink cartridge which has the ink hold section which held ink, and is a record unit characterized by to apply the ink of said this invention as said ink in the record unit which has both the head sections to carry out the regurgitation, using as an ink droplet the ink hold section which held ink, and said ink.

[0015] In addition, another this invention is an ink jet recording apparatus characterized by having an aforementioned ink cartridge or an aforementioned record unit in the ink jet recording apparatus which records by making the ink droplet formed with the ink jet method adhere to a recorded material.

[0016]

[The desirable mode of this invention] It explains per desirable mode of this invention below.

[0017] An ultraviolet-rays polymerization monomer is mentioned as a monomer solidified by grant of energy in this invention, and the acrylic monomers of radical polymerization nature and the epoxy monomers which suit a cationic polymerization system can use it suitably.

[0018] As acrylic monomers of radical polymerization nature N and N-dimethylaminoethyl methacrylate, CH<sub>2</sub>=C(CH<sub>3</sub>)—COO—CH<sub>2</sub> CH<sub>2</sub> N2 (CH<sub>3</sub>) : N and N-dimethylamino ethyl acrylate, CH<sub>2</sub>=CH—COO—CH<sub>2</sub>CH<sub>2</sub> N2 (CH<sub>3</sub>) : N and N-dimethylaminopropyl methacrylate, CH<sub>2</sub>=C(CH<sub>3</sub>)—COO—CH<sub>2</sub> CH<sub>2</sub> CH<sub>2</sub> N2 (CH<sub>3</sub>) : N and N-dimethylaminopropylacrylate, CH<sub>2</sub>

=CH-COO-CH<sub>2</sub> CH<sub>2</sub> CH<sub>2</sub> N<sub>2</sub> (CH<sub>3</sub>) : N and N-dimethylamino acrylamide, CH<sub>2</sub> =CH-CON(CH<sub>3</sub>) 2:N and N-dimethylamino meta-acrylamide, CH<sub>2</sub> =C(CH<sub>3</sub>)-CON<sub>2</sub> (CH<sub>3</sub>) : N and N-dimethylaminoethyl acrylamide, CH<sub>2</sub> =CH-CONHC<sub>2</sub>H<sub>4</sub> N<sub>2</sub> (CH<sub>3</sub>) : N and N-dimethylaminoethyl meta-acrylamide, CH<sub>2</sub> =C(CH<sub>3</sub>)-CONHC<sub>2</sub>H<sub>4</sub> N<sub>2</sub> (CH<sub>3</sub>) : N,N-dimethylaminopropyl acrylamide, CH<sub>2</sub> =CH-CONH-C<sub>3</sub>H<sub>6</sub>N<sub>2</sub> (CH<sub>3</sub>) : N and N-dimethylaminopropyl meta-acrylamide, CH<sub>2</sub> =C(CH<sub>3</sub>)-CONH-C<sub>3</sub>H<sub>6</sub>N<sub>2</sub> (CH<sub>3</sub>) : And these matter formed into 4 class is especially excellent in color-material dyeing property, and desirable. Moreover, ultraviolet curing mold monomers well-known in itself, such as a reactant of the acrylic ester (meta) of polyhydric alcohol, the acrylic ester (meta) of the glycidyl ether of polyhydric alcohol, the acrylic ester (meta) of a polyethylene glycol, the acrylic ester (meta) of the ethylene oxide addition compound of polyhydric alcohol, and a polybasic acid anhydride and hydroxyl-group content (meta) acrylic ester, and oligomer are used. In these matter, the high matter of compatibility with ink and a hydrophilic property is chosen, and it is used.

[0019] As epoxy monomers which suit a cationic polymerization system, the glycidyl ether of polyhydric alcohol, glycidyl ester, aliphatic series annular epoxide, etc. are used.

[0020] In this invention, in order to use a pigment as a color material, the cure rate of a monomer tends to become slow. Therefore, as a polymerization system of the monomer of UV polymerization, the monomer of the high Brit polymerization system which is using vinyl ether and acryloyls together is desirable, and, subsequently to the order of a cationic polymerization system and a free radical polymerization system, selects. When using the monomer which has a polyfunctional radical, the amount used has 1 - 10% of desirable range to all ink weight.

[0021] As a usage of a photopolymerization initiator, one-kind use, two or more kind use, a photoinitiator, and a sensitizer may be used for a photoinitiator. What is necessary is to select suitably and just to go about selection of the main photoinitiators and sensitizers, combination, and a compounding ratio, with the ultraviolet curing monomer and the equipment used to be used.

[0022] As main things of a photoinitiator and a sensitizer, it is related with a photoinitiator. Acetophenone, 2, and 2-diethoxy acetophenone, p-dimethylamino aceto FEN, p-dimethylamino propiophenone, a benzophenone, 2-chlorobenzo phenon, pp'- dichloro benzo FEN, a pp'-bis-diethylamino benzophenone, A Michler's ketone, benzyl, a benzoin, benzoin methyl ether, Benzoin ethyl ether, benzoin iso-propyl ether, the benzoin n-propyl ether, Benzoin isobutyl ether, benzoin n-butyl ether, benzyl dimethyl ketal, Tetramethylthiuram monosulfide, thioxanthone, 2-chloro thioxanthone, 2-methylthioxanthone, azobisisobutyronitril, benzoin peroxide, G tert-butyl peroxide, 1-hydroxy cyclohexyl phenyl ketone, 2-hydroxy-2-methyl-1-phenyl-1-ON, 1-(4-isopropyl phenyl)-2-hydroxy-isobutane-1-ON, and methyl benzoyl FO mate \*\* are mentioned. The amount used is usually 0.1 - 10 % of the weight to the total amount of ultraviolet-rays hardenability resin. Moreover, in a cationic polymerization mold, photoinitiators, such as aromatic series diazonium salt, an aromatic series halo NIUMU salt, aromatic series sulfonium salt, and a metallocene compound, are used. Triphenyl SURUFONYUUMU hexafluoro phosphate, diphenyl iodine nium hexafluoroantimonate, etc. are mentioned as the example. Moreover, in the case of a cationic polymerization mold, in order to make hardening still more perfect, it is the range of 80-170 degrees C, and it is desirable to heat in 100-150 degrees C desirably especially. Although heating time changes with conditions, it is usually for 5 - 30 minutes.

[0023] The amine which contains 1 amine system:fatty amine and an aromatic series radical as a sensitizer, Piperidine 2 urea : An allyl compound system, o-tolyl thiourea 3 sulfur compound:sodium diethyl dithiophosphate, The fusibility salt 4 nitril system compound of an aromatic series sulfinic acid : N, N, a JI permutation p amino benzonitrile, R1 R1 Methyl group, ethyl group, B cyano ethyl group, or B chloro ethyl group 5 phosphorus compounds : [ Tri-n-butyl phosphine, ] NETORIUMU diethyl JICHIOHOSU feed 6 nitride : A Michler's ketone, N NITORISO hydroxylamine derivative, an oxazolidine compound, and tetrahydro one — 1 and 3 oxazine compounds — Condensate 7 chlorine compound of formaldehyde or an acetaldehyde, and diamine: A carbon tetrachloride, the macromolecule-ized amine of the resultant of hexachloroethane 8 epoxy resin and an amine, and a triethanolamine thoria chestnut rate are mentioned.

[0024] As a pigment used by this invention, all of organic [ well-known ] and an inorganic pigment can be used conventionally. For example, inorganic pigments, such as organic pigments, such as color lakes, such as polycyclic type pigments, such as azo pigments, such as an azo lake, insoluble azo pigment, a disazo condensation pigment, and a chelate azo pigment, a phthalocyanine pigment, perylene and a perylene pigment, an ANTOSE quinone pigment, a quinacridone pigment, a dioxazine pigment, a thio ISHIJIGO pigment, an isoindolinone pigment, and a kino FUTARONI pigment, and a basic dye mold lake, an acid-dye mold lake, and a nitro pigment, a nitroso pigment, aniline black, a daylight fluorescent pigment, titanium oxide a ferrous-oxide system, and a carbon black system be mentioned. Moreover, anything can be used, if the distribution to aquosity is possible even if it is the pigment which is not indicated by the Color Index.

[0025] Furthermore, in this invention, when using a color together, in the technical field concerned, various well-known colors can be used from the former.

[0026] For example, the azo dye as direct dye, phthalocyanine dye, the azo dye as acid dye, an anthraquinone system color, etc. are mentioned.

[0027] In this invention, when using a pigment and a color together, generally it is desirable for the range of a pigment:color (weight ratio) to be 8:2-2:8. It considers as the range of 7:3-3:7 (pigment: color) more preferably.

[0028] The water soluble resin (distributed resin) contained in order to distribute the ink pigment of this invention is meltable in the water solution in which the amine or the base was dissolved, and its weight average molecular weight is [ the range of 3000 to 30000 ] desirable. Furthermore, that whose range is 5000 to 15000 preferably is good. For example, a styrene-acrylic-acid copolymer, a styrene-acrylic-acid-acrylic-acid alkyl ester copolymer, A styrene-maleic-acid copolymer, a styrene-maleic-acid-acrylic-acid alkyl ester copolymer, A styrene-methacrylic-acid copolymer, a styrene-methacrylic-acid-acrylic-acid alkyl ester copolymer, A styrene-maleic-acid half ester copolymer, a vinyl naphthalene-acrylic-acid copolymer, a vinyl naphthalene-maleic-acid copolymer, styrene-maleic-anhydride-maleic-acid half ester copolymers, or these salts can be used.

[0029] As a measuring method of the weight average molecular weight of the above water soluble resin, although various approaches are mentioned, it is common to measure by GPC (gel bar MIESHON chromatography) etc.

[0030] Furthermore, preferably, since that the whole ink is adjusted to neutrality or alkalinity can use the ink of this invention as the ink which raised the solubility of the above mentioned water soluble resin, and was excellent in much more mothball stability, it is desirable. Since pH of ink may cause corrosion of the various members currently used for the ink jet recording device, it is desirable to consider as the range of pH of 7-10 preferably.

[0031] Moreover, as a pH regulator used in the aquosity medium of this invention, inorganic alkali chemicals, such as a hydroxy compound of alkali metal, such as various organic amines, such as diethanolamine and triethanolamine, and a sodium hydroxide, a lithium hydroxide, a potassium hydroxide, an organic acid, and a mineral acid are mentioned, for example.

[0032] Like the above, it carries out, and a pigment and water soluble resin are distributed or dissolved into a water-soluble medium.

[0033] In the ink of this invention, a suitable aquosity medium is the mixed solvent of water and a water-soluble organic solvent, and it is [ water ] desirable to use not the common water containing various ion but ion exchange water (deionized water).

[0034] As a water-soluble organic solvent used mixing with water For example, methyl alcohol, ethyl alcohol, n-propyl alcohol, Isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, Alkyl alcohols with 1-4 carbonization, such as tert-butyl alcohol and isobutyl alcohol; Dimethylformamide, Amides, such as dimethylacetamide; An acetone, the keto alcohol; tetrahydrofuran of diacetone alcohol, Ether, such as dioxane; Poly ARUKOREN glycols; ethylene glycol, such as a polyethylene glycol and a polypropylene glycol, Propylene glycol, a butylene glycol, triethylene glycol, 1, 2, 6-hexane triol, thiodiglycol, hexylene glycol, alkylene glycol; in which alkylene groups, such as a diethylene glycol, contain 2-6 carbon atoms — glycerol: — the ethylene glycol monomethyl (or ethyl) ether — The low-grade alkyl ether of polyhydric alcohol, such as the diethylene-glycol methyl (or ethyl) ether and the triethylene glycol monomethyl (or ethyl) ether; a N-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, etc. are mentioned.

[0035] Moreover, an organic amine neutralizes a dispersant, and in order to adjust pH of ink to a neutral - basic field, the whole ink makes it contain it 0.001 to 10% of the weight preferably in the ink of this invention in the water-soluble organic solvent of these many.

[0036] Moreover, although it is suitably chosen according to a request and optimum dose contains about the water-soluble above-mentioned organic solvents other than an organic amine, the low-grade alkyl ether of polyhydric alcohol, such as polyhydric alcohol, such as a diethylene glycol, and the triethylene glycol monomethyl (or ethyl) ether, is desirable especially.

[0037] Furthermore, in order to acquire the stability of the regurgitation, it found out that it was effective to add aliphatic series monohydric alcohol, for example, ethanol, or isopropyl alcohol 3% or more. That is, it is considered since foaming on the exoergic resistor of the thin film of ink can be carried out more to stability by adding these solvents.

[0038] Furthermore, as effectiveness of these solvents, by adding these solvents to dispersion liquid, generating of the bubble at the time of distribution is suppressed, and it can mention that efficient distribution can be performed.

[0039] Moreover, the ink of this invention can add a surfactant, a defoaming agent, antiseptics, etc. further, in order to consider as the ink which has a desired physical-properties value if needed besides the above-mentioned component. Furthermore, commercial water soluble dye etc. can be added.

[0040] For example, as a surfactant, there are nonionic surfactants, such as anionic surfactants, such as fatty-acid salts, higher-alcohol sulfate salts, liquid fatty-oil sulfate salts, and alkyl allyl compound sulfonates, polyoxyethylene alkyl ether, polyoxyethylene alkyl ester, and polyoxyethylene sorbitan alkyl ester, and these one sort or two sorts or more can be used, choosing them suitably. Although the amount used changes with dispersants, 0.01 - 5 % of the weight is desirable to the ink whole quantity.

[0041] Under the present circumstances, as for the surface tension of ink, it is desirable to determine that the addition of a surfactant will become 30 or more dyne/cm. It is because the situation which is not desirable as for printing \*\*\*\* (gap of the impact area of an ink droplet) at the tip of a nozzle depended for getting wet is caused in a recording method like this invention that a value with the surface tension of ink smaller than this is shown.

[0042] As engine performance generally required of the ink for ink jets, although physical properties, such as viscosity of ink, surface tension, and pH, were mentioned, even if satisfied with a dispersed system like watercolor pigment ink of these physical properties, there were many cases where foaming of ink was unstable.

[0043] Then, it found out not generating a deposit on a thin film resistor, even if it is the thing of all ink weight preferably considered as 1% or less 2% or less about the amount of the water soluble resin which is dissolving into ink as a result of are thermally [ this invention persons ] stable in watercolor pigment ink and studying wholeheartedly the engine performance of the ink in which the still more nearly optimal foaming is possible, it foams correctly also on the drive conditions of versatility [ ink ] on a resistor and it continues for a long period of time further. That is, when excessive water soluble resin existed in ink so much to the pigment, even if it gave predetermined heat energy on the thin film resistor, ink did not foam, or the water soluble resin of these surpluses became insoluble matter with the heat at the time of pulse impression, and it deposited on the thin film resistor, and had become the cause which causes turbulence of the non-regurgitation or printing.

[0044] The water soluble resin which is dissolving here points out the resin in the condition of having dissolved into the liquid medium without sticking to a pigment into ink. One means to reduce the amount of this water soluble resin that is dissolving is 3:1-30:1, and adjusting to the range of 10:3-30:1 preferably in a weight ratio about the ratio of a pigment and water soluble resin at ink creation time.

[0045] Furthermore, as for the pigment in dispersion liquid, and the total amount of water soluble resin, it is desirable that it is 30% or less preferably 10% or more on weight criteria. It is because it cannot distribute efficiently and the optimal distributed condition cannot be acquired as the reason, unless the pigment and water soluble resin more than fixed concentration exist in dispersion liquid.

[0046] After adding and stirring a pigment first as the preparation approach of the water-soluble pigment dispersing element of this invention in the water solution which contains water soluble resin (distributed resin), an amine, and water at least, it distributes using the below-mentioned distributed processing, centrifugal separation processing is performed if needed, and desired dispersion liquid are obtained. Next, a component which was mentioned by the above which contains

polymethylmethacrylate in these dispersion liquid is added and stirred, and it considers as ink.

[0047] Here, as ink of this invention, the viscosity is preferably adjusted to 10cps or less.

[0048] In order to especially make the amount of the water soluble resin (resin for which a pigment is not adsorbed) which is dissolving into ink 2% or less, in the creation approach, it is required to stir the water solution containing resin, an amine, and water more than for 60 degrees C and 3 minutes, and to dissolve resin completely beforehand.

[0049] Moreover, it is required for the amine for which it asked by count from the acid number of resin, or the amount of bases to add the amount of the amine in which resin is dissolved, or a base 1.2 or more times. The amount of this amine or a base is calculated by the following formulas.

[0050]

[External Character 1]

$$\text{アミンの量 (g)} = \frac{\text{樹脂の酸価} \times \text{アミンの分子量} \times \text{樹脂量(g)}}{56000}$$

[0051] Furthermore, before carrying out distributed processing of the water solution containing a pigment, it is also required to perform pre mixing more than for 30 minutes. This pre mixing actuation is for improving the wettability on the front face of a pigment, and promoting adsorption on a pigment front face.

[0052] As amines added by part acid liquid, organic amines, such as monoethanolamine, diethanolamine, triethanolamine, aminomethyl propanol, and ammonia, are desirable.

[0053] On the other hand, although what kind of thing may be used as long as the disperser used for this invention is a disperser generally used, a ball mill, a roll mill, a sand mill, etc. are mentioned, for example.

[0054] Also in it, the sand mill of a high-speed mold is desirable, for example, a super mill, a Sand grinder, a bead mill, an agitator mill, a grain mill, a die no mill, a pearl mill, the COBOL mill (all are trade names), etc. are mentioned.

[0055] Although technique, such as making size of the grinding media of a disperser small, enlarging the filling factor of grinding media and lengthening the processing time, making a regurgitation rate late, and classifying with a filter, a centrifugal separator, etc. after grinding, is used as an approach of obtaining the pigment which has desired particle size distribution in this invention, you may use combining such technique.

[0056] In addition, a pigment content and the pitch by which the pigment was adsorbed are settled using an ultracentrifuge etc. as an approach of measuring the amount (resin for which a pigment is not adsorbed) of the water soluble resin which is dissolving into the ink concerning this invention, and TOC (Total Organic Carbon, total-organic-carbon meter), a weight method (how to make carry out evaporation to dryness of the supernatant, and measure the amount of resin), etc. are suitably used in the amount of residual resin contained in this supernatant.

[0057] The ink of this invention is drainage system ink, and it is desirable that they are 50% or more of all ink weight as a content of water.

[0058] The ink jet record approach of having used the ink of this invention It is the ink jet record approach which gives the ink more than Isshiki from the recording head equipped with two or more ink deliveries at least to a recorded material without ink absorptivity, and forms a record image. The first process which carries out defecation processing of said recorded material front face, and the 2nd process which an ink droplet is made to fly according to an image recording signal, gives an ink droplet to the predetermined location of said recorded material, and forms a record image from the delivery of said recording head. The 3rd process which stiffens the ink given on said recorded material is included.

[0059] Furthermore, by the ink jet record approach of this invention, the 2nd process is preferably performed by the bubble jet recording method which makes an ink droplet breathe out according to an operation of heat energy.

[0060] On the other hand, the ink jet equipment which can be used for the ink jet record approach of this invention It is the ink jet recording device which gives the ink more than Isshiki from the recording head equipped with two or more ink deliveries at least to a recorded material without ink absorptivity, and forms a record image. a) The means which carries out defecation processing of said recorded material front face, the recording head equipped with two or more ink deliveries which an ink droplet is made to fly according to b image recording signal, and give an ink droplet to the predetermined location on said front face of a recorded material, and a means to stiffen the ink droplet of the c aforementioned image formation are provided.

[0061] In the equipment concerning this invention, the means of a may be omitted with a recorded material. Moreover, as technique, it is UV/O3. Washing is mentioned.

[0062] In the means of c), a (ultraviolet-rays UV) exposure lamp, an electron ray, heat, etc. are mentioned. In a UV irradiation lamp, since heat may occur and a recorded material may deform, when a cooler style, for example, a cold mirror, a cold filter, work-piece cooling, etc. possess, it is desirable.

[0063] Next, one example of the recording device which can be used for the ink jet record approach of above-mentioned this invention is explained.

[0064] Drawing 3 is the typical schematic diagram showing the whole recording device. Among drawing, 710 are a recording head and are the ink jet recording head of 360dpi64 nozzle. Furthermore, four heads for four classification by color of Y (yellow), M (Magenta), C (cyanogen), and Bk (black) are prepared, and it is set so that a full color image can be recorded by one scan. 701 is a recorded material. Two or more sheet recorded material 701 is set to the stocker 711, and it is sent to a band conveyor by the conveyance machine 712, and is sent out to the tray 715 for printing. 714 is an auxiliary roller for delivery.

[0065] Adsorption immobilization of the recorded material 701 sent to the tray 715 for printing is firmly carried out by suction with a pump 716 on a tray. The recorded material 701 on 715 is sent into the field to which the 1st down stream processing is performed. 704 is UV/O3. It is a lamp. With a recorded material, when surface NURE nature is low, this surface treatment is performed and the NURE nature of ink and adhesion are raised. This down stream processing may pass.

[0066] Shortly after a recorded material is taken out from the field of the 1st process by the delivery motor of 717, ink jet record by the recording head 710 is performed. Although a piezo method and various ink jet recording methods, such as an

electrostatic method, can be used for ink jet record which is this 2nd process, the Bubble Jet which is stabilized and can perform high-speed record is suitable.

[0067] Moreover, if it seems that problems, such as NIJIMI, occur as the record approach in one-pass printing, a two pass and 4 pass printing will be adopted.

[0068] The recorded material with which the image was recorded is immediately conveyed to the field to which processing of the 3rd process is performed. Here, 705 is a UV irradiation lamp.

[0069] Since heat occurs and deformation of a recorded material may be caused by the exposure of UV lamp, heating prevention devices, such as a cold mirror, a cold filter, and work-piece air cooling (un-[ in a Fig.] illustrating above), are required.

[0070] The recorded material (record object which has a record image) which passed through the above three down stream processing is conveyed by the stocker 719 through a band conveyor 720 and the delivery roller 721, and is contained by the predetermined location with a handler 718.

[0071] In the illustrated example, although a recorded material 701 is the thing of a tabular configuration, the tray which conveys this is suitably adjusted so that it can respond to the configuration of a recorded material. For example, correspondence also in record to a disc-like recorded material is attained by using spacer 811 grade as shown in drawing 5. Moreover, as for this equipment, it is desirable to have a means to adjust the distance of a recording head and the image formation side of a recorded material according to the thickness of a recorded material.

[0072] Moreover, in order to promote the heat hardening in the 1st process and 3rd process, by forming heating means, such as a heater, in a tray auxiliary, for example, heating a recorded material before each processing, heating effectiveness is raised even to processing of a comparatively large-sized recorded material with big heat capacity, and effective processing is attained.

[0073] In addition, when it heat-treats, and deviation arises in a dimension, a gap of the cross direction of record and a feed direction arises and problems, such as generating of the white stripe in a record image and gap of printing size, arise by thermal expansion, as shown in drawing 6. It compares with the value beforehand set up with the comparator after detecting the skin temperature of the image formation side of a recorded material 901 with the thermo sensor 902, amplifying with the amplifier (Amp) and digitizing this by the A/D converter (A/D). It is desirable to use the system which adjusts a signal to a recording head 910 and a motor 903 by the optimal delay signal over the signal of a clock so that a recorded material can be set at delivery and a right location.

[0074] Moreover, in order to make a recorded material convey with a sufficient precision, marking of the mark can be carried out to the non-printing area of a recorded material with etching or a press, the location can be read with a suitable read means, the location of a recorded material can always be checked, a conveyance means can be controlled by the location, and more accurate conveyance can also be performed. Moreover, when a camber etc. is in a recorded material, it is also effective in a roller etc. to add the function which corrects a camber because of [, such as a camber, ] amendment. Moreover, what is necessary is just to remove this with the means of a stirring press etc. after printing, if the aforementioned mark spoils product value.

[0075] Drawing 4 is the typical schematic diagram showing other whole recording device. 730 in drawing is for example, 360dpi at a recording head. It is the ink jet recording head of 64 nozzles. 730 is a head on which 730Y, 730M, 730C, and 730B print one color each of Y (yellow), M (Magenta), C (cyanogen), and B (black).

[0076] After printing yellow by 730Y, UV lamp of 705 performs UV irradiation and only UV which the front face of ink hardens at least is irradiated.

[0077] by the delivery motor of 717, the recorded material 701 on the conveyance tray 715 is conveyed to the place of the following 730M ink jet recording head in order to print the following color. An ink front face is stiffened with the 705UV lamp after printing. Then, a full color image is repeatedly formed with 730C and 730B. In addition, detail explanation is the same as explanation of drawing 3.

[0078] Although drawing 3 and drawing 4 are performing UV irradiation after one color or 4 color printing, a spot UV lamp may be installed beside an ink cartridge, and UV irradiation may be carried out for every one pass (un-illustrating).

[0079]

[Example] Next, an example explains this invention in more detail.

[0080] The ink of a presentation (weight ratio) as shown in one or less example was created. In addition, four colors of pigments were created.

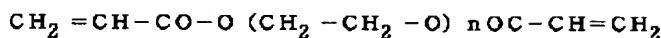
[0081]

[Table 1]

表1

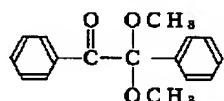
紫外線重合モノマー	* 1	7. 4 %
光開始剤	* 2	0. 4 %
水性顔料分散体	* 3	73. 8 %
(顔料／水溶性樹脂／水)		
界面活性剤	* 4	7. 4 %
水溶性溶剤	* 5	11. 1 %

\* 1 : NKエステルA-400 (新中村科学)



(n = 9)

\* 2 : イルガキュア651 (チバガイギー)



\* 3 : シアン (顔料固形分16%)

マゼンタ (顔料固形分16%)

イエロー (顔料固形分16%)

ブラック (顔料固形分16%)

\* 4 : ノイゲンET150、10%aq [第一工業製薬(株) 製]

\* 5 : イソプロピルアルコール (IPA) / ジエチレングリコール (DEG)

[0082] According to the flow of drawing 1, ink was created using the ink of the above-mentioned presentation, and the image was formed on the acrylic and the polycarbonate.

[0083] First, NK ester A-400 It is the IRUGA cure 651 to 2g. 0.1g was added and stirring was performed for about 10 minutes. Furthermore, IPA was added, it carried out for stirring 5 minutes, and viscosity was adjusted to 5cp (it considers as Solution A).

[0084] Next, 2g (10%aq) of noy genes was added to pigment ink (pigment / water-soluble-resin / water) 20g, and stirring was performed for about 30 minutes (it considers as Solution B). Pigment ink is beforehand adjusted to 5cp.

[0085] Pigment ink: Solution A and Solution B were mixed so that it might be set to monomer =10:1, and the line was taken as ultraviolet curing ink for stirring 30 minutes. It is in the inclination for the glossiness of a printing hardened material to fall at the same time a regurgitation property will fall, if the amount of monomer increases about this compounding ratio.

[0086] First, the yellow ink of this above-mentioned constituent was used. After printing and printing with an ink jet printer as shows yellow ink to drawing 2, ultraviolet rays were irradiated at the printing section. the UV irradiation reinforcement at this time — 10 J/cm<sup>2</sup> it was . It hardened to the degree of hardness as which yellow ink is touched by the fingertip at this time, and a degree of hardness is sensed enough.

[0087] Next, it printed so that Magenta ink with the above-mentioned presentation might be lapped with the printing section of yellow ink in part. The ultraviolet rays after printing were irradiated and hardening of Magenta ink was checked.

[0088] In this example, the acrylic and the polycarbonate were used as a recorded material.

[0089] Although the part with which ink laps with an optical microscope was observed, there was no trace which has generated the blot and printing grace was good. Moreover, in the fitness of adhesion with a recorded material, even if rubbed, it did not peel.

[0090] Furthermore, also fading [ of the color by UV irradiation ] was not observed.

[0091] in this example, scratch nature improved the SN leveler H907 (Sannopuko) by [ 0.5% of ] coming out comparatively and adding to the monomer in the ink of the above-mentioned presentation.

[0092] Furthermore, by carrying out little addition of the CHIEGU recall as an additive, fixing of a nozzle could be prevented and the printing engine performance improved.

[0093] Although UV irradiation irradiated after each color printing (10 J/cm<sup>2</sup>), since it stiffened the front face even if it printed the following color, since it stiffened each color completely, even if it printed the following color, it did not bleed, and formation of a good color picture was possible for it.

[0094] The ink of a presentation (weight ratio) as shown in the example 2 following was created. In addition, pigment ink is \*\*\*\* for 4 colors.

[0095]

[Table 2]

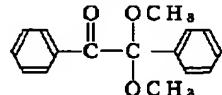
表2

紫外線重合モノマー	* 1	7. 4%
光開始剤	* 2	0. 4%
水性顔料分散体	* 3	73. 8%
	(顔料／水溶性樹脂／水)	
界面活性剤	* 4	7. 4%
I P A		6. 7%
水		4. 4%

\* 1 : LR8765 (BASF)

1. 4ブタジオールのジェボキシアクリル酸エステル

\* 2 : イルガキュア651 (チバガイギー)



* 3 : シアン	(顔料固形分 16%)
マゼンタ	(顔料固形分 16%)
イエロー	(顔料固形分 16%)
ブラック	(顔料固形分 16%)

\* 4 : ノイゲン10% aq

[0096] The manufacture approach of ink and the printing approach are the same as that of an example 1. Printing grace was good although printed on the acrylic and the polycarbonate. Moreover, adhesion with a recorded material was also good, and it also received rubbing and did not peel.

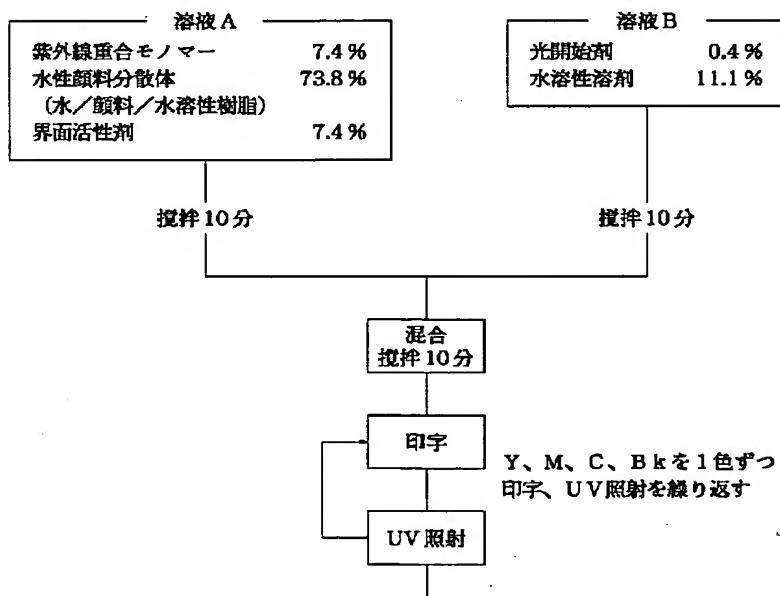
[0097] It created by the flow which shows the ink of a presentation as shown in the example 3 following below.

[0098] The used matter name is the same as a thing given in an example 1.

[0099]

[Table 3]

表3



[0100] Ink shelf life was good, without causing gelation by the dark reaction by keeping the ultraviolet-rays polymerization monomer and the photoinitiator separately.

[0101] The ink of a presentation (weight ratio) as shown in example 4 table 4 was created. First, the ultraviolet curing monomer and the weight ratio of a photopolymerization initiator were set to 1:0.05, and stirring was performed for about 10 minutes, and further, IPA of one 1.5 times the weight of this was added to monomer weight, it stirred for 5 minutes, and viscosity was adjusted to 5cps (it considers as Solution A).

[0102] Next, pigment ink (pigment / water-soluble-resin / water):color ink (a color/water) = it mixes so that it may be set to 10:0, 8:2, 5:5, 2:8, and 0:10 (it considers as Solution B).

[0103] Solution B: Solution A and Solution B were mixed, stirring was performed for 30 minutes, and it considered as ultraviolet curing ink so that it might be set to monomer =10:1. Since the inclination for the feeling of gloss of a printing

hardened material to fall was suited while the regurgitation property fell when the amount of monomer increased about this compounding ratio, it was referred to as solution B:monomer =10:1.

[0104] After printing and printing a pigment and a color with an ink jet printer using four colors, respectively, they irradiated ultraviolet rays at the printing section. The UV irradiation reinforcement at this time, and OD value after an exposure and the viscosity of ink are doubled, and it lists to Table 4.

[0105]

[Table 4]

表4

*1 紫外線硬化 モノマー (%)	*2 顔料インク 10%溶液 (%)	*3 染料インク 10%溶液 (%)	*4 光重合開始 剤 (%)	IPA (%)	インク 粘度 (cp)	紫外線 強度 (J/cm <sup>2</sup> )	OD	耐光性
8.0	79.7	—	0.4	12.0	7.3	10	○	○
8.0	63.7	15.9	0.4	12.0	6.5	5	○	○
8.0	39.8	39.8	0.4	12.0	4.1	2	○	○
8.0	15.9	63.7	0.4	12.0	3.4	0.3	△	△
8.0	—	79.7	0.4	12.0	3.0	0.1	△	×

\*1: NK ester A-400 (new Nakamura chemistry)

CH<sub>2</sub> =CH-CO-O(CH<sub>2</sub> -CH<sub>2</sub> -O)<sub>n</sub>OC-CH=CH<sub>2</sub>(n=9)

\*2: Cyanogen (10% of pigment solid content)

Magenta (10% of pigment solid content)

Yellow (10% of pigment solid content)

Black (10% of pigment solid content)

\*3: Cyanogen — Pro jet cyanogen (10% of color solid content)

Magenta — Acid red (10% of color solid content)

Yellow — Direct yellow (10% of color solid content)

Black — Hood black (10% of color solid content)

\*4: IRUGA cure 651 (Ciba-Geigy)

[0106] Although the setting time of ink became quick as the rate of a color increased, in connection with it, it fell, lightfastness also fell and OD value was performed. Therefore, it became clear as a ratio of a pigment and a color that 8:2-2:8 were suitable by the weight ratio.

[0107] In addition, the following approaches and criteria estimated the term of OD of front Naka, and the light-fast term.

[0108] [The approach of a radiationproofing test and valuation basis] Each ink of an example was printed to the 2cmx2cm solid pattern, the ultraviolet rays of the amount shown in front Naka were irradiated, and it was made to harden on a transparent polycarbonate resin plate. The test piece of the hardened solid pattern was attached in 0 m of atlas xenon fade, the continuous irradiation trial of 100 hours was performed, the reflection density of order was measured, and the OD rate of change R was calculated. Here, it is R=[ODbefore OD/exposure after exposure] ×100. A valuation basis is O:R>=90:90>R>=80\*\*:80>=R>60x:60>R. It indicated by carrying out.

[0109] [Valuation basis of OD] The following criteria indicated OD.

O :OD>=1.2O:1.2>OD>=1.1\*\*:1.1>OD[0110] Based on example 5 example 4, in order to investigate the optimal range further, the ratio of a pigment and a color was mixed so that it might be set to 8:2, 7:3, 6:4, 5:5, 4:6, 3:7, and 2:8, and each property was investigated.

[0111] The result was listed to Table 5 (about an ingredient, it is the same as an example 4).

[0112]

[Table 5]

表5

紫外線硬化モノマー(%)	顔料インク10%溶液(%)	染料インク10%溶液(%)	光重合開始剤(%)	IPA(%)	インク粘度(cp)	紫外線強度(J/cm <sup>2</sup> )	OD	耐光性
8.0	63.7	15.9	0.4	12.0	6.5	5	◎	◎
8.0	55.7	23.9	0.4	12.0	6.5	3.8	◎	◎
8.0	47.8	31.8	0.4	12.0	4.7	2.7	○	○
8.0	39.8	39.8	0.4	12.0	4.1	2	○	○
8.0	31.8	47.8	0.4	12.0	3.7	1	○	○
8.0	23.9	55.7	0.4	12.0	3.5	0.5	○	○
8.0	15.9	63.7	0.4	12.0	3.4	0.3	△	△

From a cure rate and relation, such as lightfastness, the range of the ratios 7:3-3:7 of a pigment and a color is preferably suitable.

[0113] LR8765 (BASF) of the diepoxy acrylic ester of 1.4 Buta Diol was used for the example 6 ultraviolet-rays polymerization monomer, and ink was created with the same compounding ratio as examples 4 and 5.

[0114] Although the setting time of ink became quick as the rate of a color increased also in this case, in connection with it, OD value fell, lightfastness also fell and the same result as examples 4 and 5 was obtained.

[0115]

[Effect of the Invention] The following effectiveness has been checked the ink jet, especially the bubble jet recording head by the ink and the ink jet record approach by this invention as explained above.

[0116] \*\* Image formation becomes possible on a recorded material without ink absorptivity.

[0117] \*\* Since the blot between ink does not take place, formation of a color picture with good printing grace is attained.

[0118] \*\* The printing object in which a water resisting property and lightfastness are very excellent is obtained.

[0119] \*\* Ink with sufficient ink shelf life is obtained.

[0120] \*\* Since it is a drainage system, it is advantageous to an environment.

[Translation done.]

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## 【特許請求の範囲】

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	規則第に従く				

(57) [要約]  
【目的】被記録材、特に、インク吸収性のない被記録材に対して良好な記録が可能なインク、及びこれを用いるインクジェット記録方法と機器を提供する。  
【構成】水溶性液体中に、少なくとも顔料、水溶性樹脂、エネルギーの付与により固体化する水溶性モノマー、及び重合開始剤を含むことを特徴とするインクである。更には、前記インクを用いたインクジェット記録方法、及びインクジェット用機器類である。

【請求項 1-3】 前記インクジェット方式が、インクに熱エネルギーを作用させる方式である請求項 1-2 に記載のインクジェット記録方法。	【請求項 1-4】 前記被記録材がインク吸収性のないものである請求項 1-2 に記載のインクジェット記録方法。	【請求項 1-5】 更に、被記録材に付着したインクに対し、紫外線、熱又は電子線を付与する過程を有する請求項 1-2 に記載のインクジェット記録方法。	【請求項 1-6】 インクを収容したインク収容部を有するインクカートリッジにおいて、前記インクとして前記請求項 1-乃至 1-1 の何れか 1 に記載のインクを適用したことを特徴とするインクカートリッジ。	【請求項 1-8】 前記ヘッド部において、前記インクに有する記録ユニットにおいて、前記インクを適用したことを特徴とする記録ユニット。
60	【請求項 1-8】 前記ヘッド部において、前記インクに熱エネルギーを作用させてインク吐出を行う請求項 1-7	に記載のインクジェット記録方法。	【0005】 【発明が解決しようとする課題】 従来の技術においては、以下に示す問題がある。	30 いように紫外線硬化型樹脂に非活性性染料を用いてい る。



(5)

【0033】本発明のインクにおいて好適な水性媒体は、水及び水溶性有機溶剤の混合溶液であり、水は顔々のイオンを含むる一般の水ではなく、イオン交換水(脱イオン水)を使用するのが好ましい。

【0034】水と混合して使用される水溶性有機溶剤としては、例えば、メチルアルコール、エチルアルコール、n-ブロピルアルコール、イソブロピルアルコール、n-ブチルアルコール、sec-ブチルアルコール、tert-ブチルアルコール、イソ-ブチルアルコール等の炭化数1～4のアルキルアルコール類；ジメチルホルムアミド、ジメチルアセトアミド等のアミド類；アセトン、ジアセトアルコール類のケートアルコール類；テトラヒドロフラン、ジオキサン等のエーテル類；ポリエチレンクリコール、ポリブリエンクリコール等のポリアルコレングリコール類；エチレングリコール、トリエチレングリコール、ブチレングリコール、トリエチレングリコール、1、2、6-ヘキサントリオール、オジグリコール、ヘキサンクリコール、ジエチレングリコール等のアルキレン基が2～6個の炭素原子を含むアルキレングリコール類；グリセリン；エチレングリコール(またはエチル)エーテル、ジエチレングリコールメチル(またはエチル)エーテル、トリエチレングリコールモノメチル(またはエチル)エーテル等の多価アルコールの低級アルキルエーテル類；N-メチルエーテル-2-ビロリドン、1、3-ジメチル-2-イミダゾリジン等が挙げられる。

【0035】また、これらの多くの水溶性有機溶剤の中で、有機アミンは分散剤を中和し、インクのpHを中性～堿基性の領域に調節するために本発明のインク中に、好ましくはインク全体の0.001～10重量%含有させる。

【0036】また、有機アミン以外の上記水溶性有機溶剤については、所望に応じて適量選択され、適量が含まれるが、中でもジエチレングリコール等の多価アルコール、トリエチレングリコールモノメチル(またはエチル)エーテル等の多価アルコールの低級アルキルエーテルが好ましい。

【0037】更に、吐出の安定性を得るために、脂肪族一価アルコール、例えば、エタノール或はイソブロピルアルコールを3%以上添加することにより、インクの粘度をより安定制であることが可能であることを見い出した。即ち、インクの粘度の発現をより安定制であるからと考えられる。

【0038】更に、これらの溶剤の効果としては、分散液にこれら溶剤を添加することにより、分散時における発生が抑えられ、効率的な分散を行えることを挙げることができる。

【0039】また、本発明のインクは、上記の成分のほか、必要に応じて所望の物性値を有するインクとするために、界面活性剤、消泡剤、防腐剤等を更に添加するこ

ができる。更に、市販の水溶性染料等も添加することができる。

【0040】例えば、界面活性剤としては、脂肪酸塩類、高級アルコール硫酸エステル類、液体脂肪油硫酸エステル類、アルキルアリスルホン酸類等の陰イオン界面活性剤、ポリオキシエチレンアルキルエーテル類、ポリオキシエチレンアルキルエステル類、ポリオキシエチレンアルキルエステル類等の非イオン性界面活性剤があり、これらの1種または2種以上を選択して使用することができる。その使用量は分散剤により異なるが、インク全量に対して0.01～5重量%が望ましい。

【0041】この點、インクの表面張力は3.0 dyn/cm以上になるよう界面活性剤の添加量を決定することが好ましい。なぜなら、インクの表面張力がこれよりも小さい値を示すことは、本発明のような記録方式においては、ノズル先端の墨滴による印字およびインク滴の着弾点のズレ等の好ましくない事態を引き起こしからである。

【0042】一般にインクジェット用インクに要求される性能としては、インクの粘度、表面張力及びpH等の物理性が挙げられるが、水性顔料インクの様な分散系では、これらの物理性を満足していてもインクの発泡が不安定である場合が多くあつた。

【0043】そこで本発明者は、水性顔料インクで熱的に安定で、更に最適な発泡が可能なインクの性能を観察した結果、インク中に溶解している水溶性樹脂の量をインク全量の2%以下、好ましくは1%以下とすることで、抵抗体上においてインクが顔料の運動条件でも正確に発泡し、更には長期にわたっても薄膜抵抗体上に堆積物を発生しないことを見い出した。つまり、顔料に対して多量に余剰の水溶性樹脂がインク中に存在すると、薄膜抵抗体上において既存の熱エネルギーを与えても、インクが発泡しなかつたりハレス印加時の熱によつてこれらの余剰の水溶性樹脂が不溶物となり薄膜抵抗体上に堆積してしまい、不吐出や印字の乱れを引き起こす原因となっていた。

【0044】ここで溶解している水溶性樹脂とは、イン

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ては、はじめに、水溶性樹脂(分散樹脂)、アミン、水を少なくとも含有する水溶性顔料を添加し、搅拌した後、後の分散処理を用いて分散を行い、必要に応じて遠心分離処理を行い、所望の分散液を得る。次に、この分散液にボリメチルタクリートを含む上記で挙げた成分を加え、搅拌してインクとする。

【0047】ここで、本発明のインクとしては、好ましくはその粘度を1.0 cP以下に調整される。

【0048】とりわけ、インク中に溶解している水溶性樹脂(顔料に未吸着の樹脂)の量を2%以下にするため<sup>\*10</sup>、アミンの量(g) =  $\frac{\text{樹脂の量} \times \text{アミンの分子量} \times 100}{56000}$

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\*10には、作成方法において、樹脂、アミン及び水を含む水溶性樹脂(分散樹脂)、アミン及び水を含む水溶性樹脂を60°C、3分間に以上搅拌して樹脂を予め完全に溶解せざることが必要である。

【0049】また、樹脂を溶解させるアミンあるいは塩基の量を、樹脂の融解から計算によって求めめたアミンあるいは塩基量の1、2倍以上添加することが必要である。このアミンあるいは塩基の量は以下の式によって求められる。

【0050】

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a) 前記記録材表面を清浄化処理する手段、前記記録材に対して、インク吐出口を複数個備えた記録ヘッドから少なくとも一色以上のインクを付与して記録画像を形成するインクジェット記録方法であり、前記記録材表面を清浄化する第一の工程と、前記記録ヘッドの吐出口より画像記録信号に応じてインク滴を飛射させ、前記記録材の所定位圖にインク滴を付与して記録画像を形成する第二の工程と、前記記録材上に付与されたインクを硬化させる第三の工程とを含む。

【0051】一方、本発明に使用する分散機は、一般に右側アミンが好ましい。

【0052】一方、本発明に使用する分散機は、一般にノズルアルデミン、ジエタノールアミン、トリエタノールアミン、アミノメチルプロパンオール、アンモニア等の右側アミンが好ましい。

【0053】一方、本発明に使用する分散機は、一般に使用される分散機であれば、如何なるものでも良いが、例えば、ボーリミル、ロールミル、サンドミル等が挙げられる。

【0054】その中でも、高速型のサンドミルが好ましく、例えば、スーパー・ミル、サンドクラインダー、ビーズミル、アジャーティミル、グレンミル、ダイノーミル、バーレミル、コボルミル(いずれも商品名)等が挙げられる。

【0055】本発明において、所望の粒度分布を有する顔料を得る方法としては、分散機の粉碎メディアのサイズを小さくすること、粉碎メディアの充填率を大きくすること、また処理時間を見戻すこと、吐出速度を遅くすること、粉碎後にフィルターや遠心分離機等で分级すること等の手法が用いられるが、これらの手法を組合せて用いてよい。

【0056】尚、本発明にかかるインク中に溶解している水溶性樹脂とは、インク中に吸着していない被媒体中に溶解している水溶性樹脂の量を測定する方法としては、超遠心分離等を用いて顔料分と顔料に吸着された樹脂分を沈殿させ、この上澄み液に含める既存樹脂量をTOC(Total Organic Carbon、全有機炭素量)や、重畳度(Light transmission ratio)、電導度(Dissolved Conductivity)等が好適に用いられる。

【0057】本発明のインクは水系インクであり、水の含有量としてはインク全量の5%以上であることが好ましい。

【0058】本発明のインクを利用したインクジェット記録方法は、インク吸收性のない被記録材に対して、イエロー、M(マゼンタ)、C(シアン)、Bk

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表2

[0096] インクの製造方法及び印字方法は、実施例1と同様である。アクリル、ポリカーボネート上に印字してみたが、印字品質は良好であった。また、被記録材との密着性も良好であり、こすりに対してはがれることもなかった。

紫外線混合モノマー	*1	7. 4%	
光重合剤	*2	0. 4%	
水性顔料分散体	*3	73. 8%	
(顔料/水溶性樹脂/水)			
界面活性剤	*4		
I.P.A.		7. 4%	
水		6. 7%	
		4. 4%	

\*1 : L.R.8705 (BASF)  
1. 4ブタノンモノマー  
\*2 : ブラック (顔料固形分10%)  
\*3 : ノイズン (顔料固形分10%)  
\*4 : マゼンタ (顔料固形分10%)

[0097] 実施例3  
[0098] 使用した物質名は実施例1に記載のものと同じである。  
[0099]

[表3]



(顔料固形分10%)

マゼンタ

(顔料固形分10%)

イエロー

(顔料固形分10%)

ブラック

(顔料固形分10%)

ノイズン

(顔料固形分10%)

マゼンタ

(顔料固形分10%)

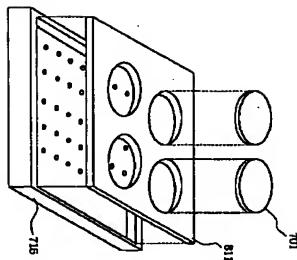
イエロー

(顔料固形分10%)

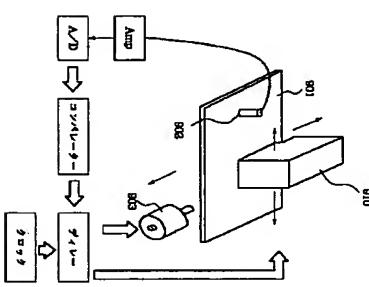


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[図5]



[図6]



## フロントページの統一

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